

Toolbox for Future-Proof Construction

Results from the Nordic Sustainable
Construction Programme

2021–2024





Nordic Sustainable Construction, Helsinki 2023

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Foreword

The built environment forms the backbone of our lives and societies in the Nordic region. Our building stock is not just a collection of structures; it is a vital part of our cultural heritage. Over the past few decades, advancements in construction practices have led to the development of competitive and efficient methods as well as innovative designs and solutions.

However, it has become increasingly evident that we cannot continue to build with the same reliance on raw materials and the same level of environmental impact. Fortunately, many influential forces within the Nordics have recognised the significant opportunity we have to build more sustainably. The Nordic Sustainable Construction programme is an example of how we in the Nordics can unite and collaborate to find solutions to this pressing issue.

Challenges such as resource scarcity, the need for circularity, and the utilisation of existing building stock are pressing in all Nordic countries. This makes it more crucial than ever to share effective solutions and inspire one another. I am delighted to note that Nordic co-operation on creating a sustainable construction sector strengthens the region internally and that our experience and analyses are sought after in the EU and the rest of the world.

Significant developments are also occurring outside the Nordic countries, and it is a strength that we can support each other in implementing new regulations from the EU. The first phase of the Nordic Sustainable Construction programme has demonstrated that the knowledge, discussions and data generated by the work packages provide a strong foundation for decision-makers and the industry, paving the way for much-needed changes in practice.

I hope that the results of this programme will be widely disseminated and utilised as a valuable resource, and that we will continue to see the Nordic countries working together on this critical agenda.

Karen Ellemann

General Secretary

Nordic Council of Ministers





"Løvtaget", Byparken in Ørestad, Copenhagen 2024

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Our built environment impacts our health, well-being, and also our climate and environment. Innovation in materials, digitalization and circularity are crucial to improve the way we build. The collaboration, Nordic Sustainable Construction, is a great example of how to combine climate protection, innovation and competitiveness of our construction sector and how to implement the values of the New European Bauhaus: Sustainability, inclusiveness and beauty.

Ursula von der Leyen, President of the European Commission



The History of Nordic Sustainable Construction

The political anchor

TIMELINE

In **2018**, the Nordic Council of Ministers decided to initiate work towards Nordic harmonisation of building regulations concerning climate emissions.

In **2019**, the Nordic Prime Ministers took it a step further by agreeing to make the Nordics the world's most sustainable and integrated region before 2030. This was the beginning of Nordic Vision 2030.

Our vision 2030



A **competitive** Nordic region

Together, we will promote green growth in the Nordic region based on knowledge, innovation, mobility and digital integration.



A **green** Nordic region

Together, we will promote a green transition of our societies and work towards carbon neutrality and a sustainable circular and bio-based economy.

The Nordic region will become the most sustainable and integrated region in the world



A **socially sustainable** Nordic region

Together, we will promote an inclusive, equal and interconnected region with shared values and strengthened cultural exchange and welfare.

Based on this vision, the Nordic Ministers for Construction and Housing agreed on a declaration highlighting the importance of collaborating towards a sustainable Nordic construction and housing sector with a circular economy and a minimised climate and environmental impact the same year. Therefore, they initiated the action plan "Nordic Sustainable and Competitive Construction", which is practically implemented through the programme – Nordic Sustainable Construction.



Picture from the first physical reference group meeting in March 2022

Since 2021, Nordic Sustainable Construction has worked to implement the Nordic Vision 2030 by supporting the Nordic countries in establishing the Nordics as a leading region in sustainable and competitive construction with minimised environmental and climate impact. Dialogue, knowledge sharing, co-creation and an aligned Nordic path for sustainable construction are key elements, and the programme utilises workshops, research, regulatory work, capacity building and interaction with Nordic lawmakers and actors along the entire value chain of construction and housing to implement Vision 2030.

In September 2023, the Nordic Ministers of Housing and Construction gathered in Iceland. Here they recommitted to a common Nordic effort to reduce climate impact from construction and housing through a new declaration.



Group photo from the meeting with the Nordic Ministers of Housing and Construction, Reykjavik, Iceland 2023

In August 2024, the Nordic Ministers of Housing and Construction gathered in Gothenburg and expressed their support for a continued Nordic Sustainable Construction Programme from 2025–2027.



Group photo of the Nordic Ministers of Housing and Construction from the meeting in Gothenburg, 2024



Entrance area at Nordens Hus, Torshavn 2024



Tromsø, 2016



Nordic Harmonisation of Life Cycle Assessment

Work Package 1

IN THIS CHAPTER, WE DIVE INTO:

Knowledge Foundation for Developing Regulation →

Nordic Harmonisation of LCA methods →

A Digital Foundation – Quality and Accessibility of Data →

LCA in the Nordics – and Beyond →

The Calculation of LCA Global Warming Potential →

The Nordic LCA Authority Group →



The structure of Work Package 1: Nordic Harmonisation of LCA

Task 1

Analysis of Nordic LCA Practices

Task 2

Data for LCA

Task 3

BIM for LCA - Calculating the Climate Impact of Buildings Through Digitalisation

Task 4

Limit Values and Monitoring the Decarbonisation of the Nordic Building Stock

Task 5

Acceleration Programme - Knowledge Sharing Clinics and Best Practise Catalogues



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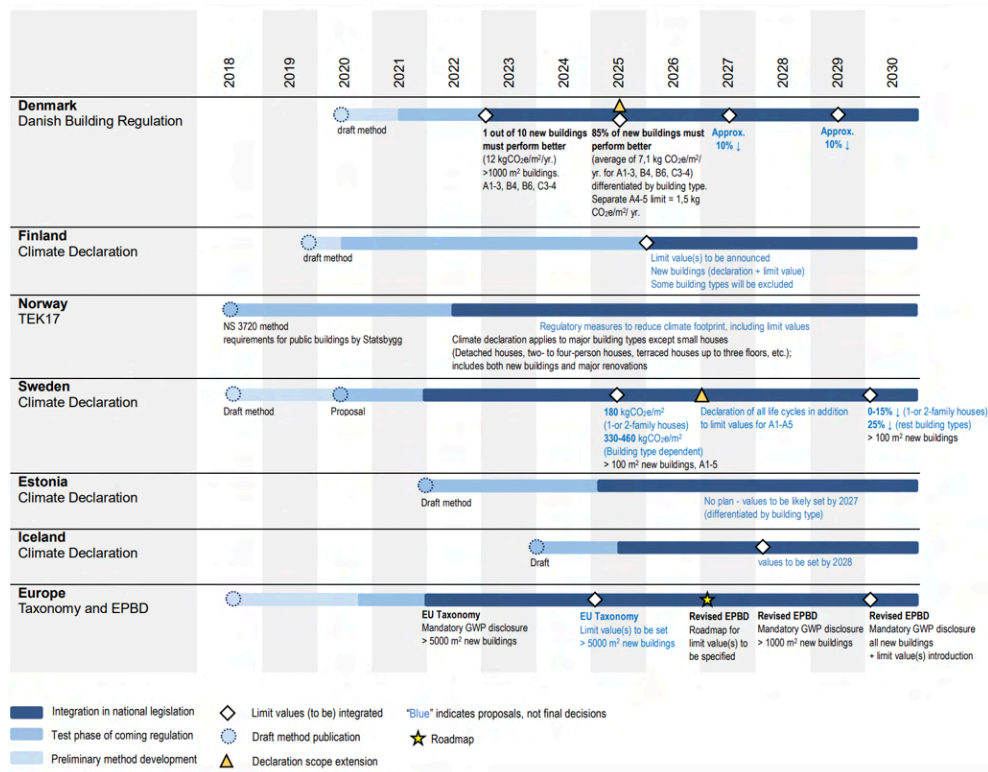
The outcomes of Work Package 1 set up bases to harmonise the climate regulations concerning new constructions in Nordic countries and in Estonia. The work gives a comprehensive analysis of different LCA methods used in the Nordic countries and a roadmap for harmonising LCA methodologies across the region. The reports also provide profound information about details of LCA calculations, data needs and guidance for the BIM-based building LCA process. This work in itself has made it possible for the Nordic authorities to cooperate more closely and learn from each other, which I find extremely important.

Maria Tiainen, senior specialist at the Ministry of the Environment in Finland, Leader of Work Package 1

Knowledge Foundation for Developing Regulation

The Nordic countries, alongside the EU, are actively developing new regulations aimed at promoting sustainable construction practices. To minimise the environmental and climate impact of new buildings, regulations including CO₂-eq limit values, climate declarations, digital tools, and strategic roadmaps are being implemented.

Timeline of climate declaration and limit values integration as of October 2024.



Source: <https://www.nordicsustainableconstruction.com/knowledge/2024/september/overview-of-nordic-climate-declarations>

Within this framework, the importance of accurate Life Cycle Assessment (LCA) calculations and a robust data foundation has become increasingly evident.

The construction sector is one of the industries with a heavy environmental and climate footprint, but a transition is underway. Beyond the economic costs, carbon emissions are now, to an increasing extent, being treated as a critical metric - almost like a currency - that influences the evaluation of construction tenders. At the same time, LCA calculations are being used to measure if the building is within the regulatory demands in the countries where limit values are applicable. In this context, LCA calculations have emerged as an essential tool enabling meaningful comparisons and informed decision-making.

Nordic Harmonisation of LCA Methods

The Nordic countries are widely recognised as global leaders in implementing regulations aimed at reducing emissions from the construction sector. The region is also at the forefront of data collection efforts related to building performance and the use of LCA as a method to set and enforce regulatory limit values. Throughout the process of enforcing regulatory limit values, Nordic countries have actively collaborated, sharing insights and experiences, and overcoming barriers together. Work Package 1 has provided a comprehensive overview and mapping by identifying specific focus areas that the Nordic and Estonian LCA authorities need to prioritise for further work.

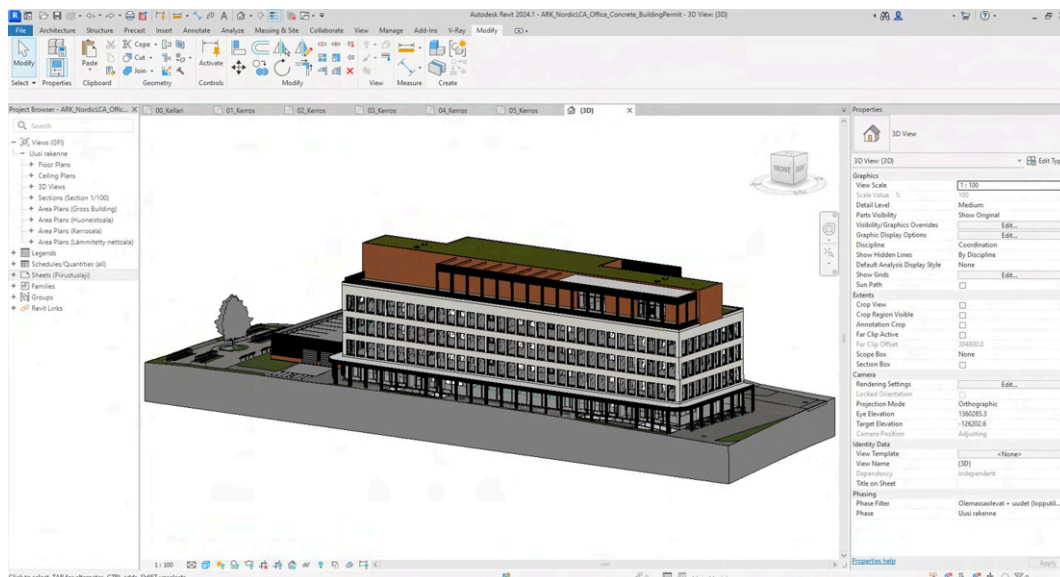
Collaboration with leading researchers and input from the industry has generated a significant knowledge foundation, which each country can utilise in the process of making new regulations and initiatives.

A Digital Foundation – Quality and Accessibility of Data

Another significant focus of Work Package 1 has been the development of digital infrastructures designed to support the increasingly intricate and data-intensive processes required for effective LCAs in construction. Recognising that the accuracy and efficiency of LCA calculations are heavily dependent on the quality and accessibility of data, Work Package 1 has worked towards creating a digital foundation that enhances both. One of the key outcomes has been the development of advanced Building Information Modelling (BIM) tools and models. These tools are tailored to integrate LCA data into the design and planning stages of construction projects. For instance, the BIM-based LCA models allow for real-time environmental impact assessments during the design phase, enabling stakeholders to make informed decisions early in the project lifecycle. This integration of BIM and LCA not only improves the precision of environmental assessments but also streamlines the process, making it more user-friendly and accessible to practitioners across the Nordic region.



Photo: Nordic Sustainable Construction, Reykjavik City Hall, Iceland 2023



Screenshot of BIM model: Revit model, Office Concrete Building, 2024

However, having these models in itself does not change the way we build. Therefore, disseminating knowledge and best practices related to digital LCA processes has been an important task as well. Work package 1 has thus delivered educational materials to support the use of digital tools. These materials include detailed guidelines on the use of digital tools for LCA, case studies that illustrate the practical application of these tools in real-world projects, and training modules designed to build competency among professionals in the construction sector. Equipping stakeholders with the necessary skills and knowledge is a way to help bridge the gap between complex LCA methodologies and their practical implementation in day-to-day construction activities.

The Calculation of LCA Global Warming Potential

Discussions about the LCA methodology are taking place not only in the Nordics but also across the EU, focusing on what to include in calculations of a building's climate impact throughout its life cycle. An important area where Work Package 1 has acted as a testbed for regulation is the vast overview and knowledge of how the countries have implemented the LCA Global Warming Regulation so far. The experiences shared during webinars, forums and in detailed reports prove to be useful for various aspects of the EU's revised Energy Performance of Buildings Directive. That includes the roadmap each EU member state has to submit by January 2027 and for the delegated act that the EU Commission is expected to publish in 2025. This will help clarify how LCA Global Warming Potential should be calculated and what is included in the regulation. This delegated act is a key component of the broader EU regulatory framework aimed at promoting sustainable construction practices. Work Package 1 has provided detailed recommendations on how LCA calculations could be structured and what is needed to specify when turning it into regulation. The Work Package has aggregated the most important lessons the Nordics and Estonia have harvested so far regarding what is needed to initiate the regulation.

8 key recommendations to initiate the regulation:

1. Build up competence

- Learning resources adapted to national contexts
- Certification schemes to foster competition

2. Secure stakeholder involvement

- Balance current readiness with future requirements
- Monitoring and revisiting regulation

3. Ensure access to generic data and standard values

- Phasing out of the conservativity factor in generic data
- Use of standard component values for as-built reporting
- Alignment of structure and content of databases.

4. Improve availability and digitalisation of EPDs

- Subsidies or automated tools designed to generate EPDs

5. Create a case basis and structure for the limit values

- Real cases sample for feasible limit values (archetypes for potentials)
- Need for differentiation of limit values

6. Determine the initial LCA scope and method

- Start with a limited scope (size and type, modules, building model)
- Need to highlight upfront carbon reduction (several options)

7. Establish a suggested limit value pathway

- Incremental implementation of methods and limit value levels (long-term roadmap)
- Impact assessments to support gradual expansion (scope/projects)

8. Consider how to improve the existing building stock

- How to improve the use of the m² we already have?
- Skills

In the report “Recommendations for a Common Nordic Approach to Combat New Buildings Life Cycle Climate Impact”, one central conclusion is the need for quality data.

Moreover, Work Package 1’s input into the delegated act has stressed the importance of incorporating, both, operational and embodied carbon into LCA calculations. By doing so, the assessment reflects not only the emissions associated with the construction and materials used but also the long-term energy use and maintenance of the building. This comprehensive approach is crucial for setting realistic and effective CO₂-eq limit values and ensuring that the construction sector contributes meaningfully to broader climate goals.

The Nordic LCA Authority Group

The results and outputs from Work Package 1 have also informed the discussions in the Nordic LCA Authority Group.

What is the Nordic LCA Authority Group?

The Nordic LCA Authority Group is a collaborative network of LCA experts from the following countries’ governments: Denmark, Finland, Iceland, Norway, Sweden, and Estonia focused on advancing the use of Life Cycle Assessments (LCA) in the construction sector. This group plays a crucial role in promoting the harmonisation of LCA methodologies across the region, enabling more consistent and comparable assessments of the environmental impacts of buildings and construction activities.

One of the primary objectives of the Nordic LCA Authority Group is to address the challenges and opportunities related to regulating embodied carbon in construction, such as differences in national regulations, data availability, and methodological approaches.

The group's activities include developing guidelines, publishing reports, creating digital tools like BIM-integrated LCA models, and providing input into regulatory processes at both the Nordic and European levels.



Car park building, Marmormolen, Copenhagen 2024

Overview of Deliveries

Work Package 1

Task 1: Analysis of Nordic LCA-practices

Roadmap for Harmonising Nordic LCA Regulations^[1]

Task 2: Data for LCA

Report: Nordic View on Data Needs and Scenario Settings for Full Life Cycle Building Environmental Assessment^[2]

Webinar: Nordic View on Data Needs and Scenario Settings for Building LCA^[3]

Task 3: BIM for LCA – Calculating the Climate Impact of Buildings Through Digitalisation

Report: The Operating Environment of Building LCA and BIM in the Nordics and Estonia^[4]

Report: BIM for Building LCA – Enhancing Nordic Sustainable Construction through Digitalisation^[5]

Webinar: BIM-Based Building LCA^[6]

Task 4: Limit Values and Monitoring the Decarbonisation of the Nordic Building Stock

Report: Harmonised Carbon Limit Values for Buildings in Nordic Countries^[7]

Report: Decarbonisation of the Building Stock^[8]

Webinar: Decarbonisation of the Nordic Building Stock and Setting Limit Values^[9]

Webinar: Harmonised CO₂-eq Limit Values for Buildings and Monitoring Decarbonisation of the Building Stock^[10]

Task 5: Acceleration Programme: Knowledge Sharing Clinics and Best Practice Catalogues

Webinar: Presenting Low Carbon Clinics to Support New Construction Projects^[11]

Report and catalogue will be published in 2025

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1. <https://www.nordicsustainableconstruction.com/news/2023/september/roadmap-harmonising-nordic-building-regulations-concerning-climate-emissions>
 2. <https://www.nordicsustainableconstruction.com/knowledge/2024/june/recommendations-for-a-common-nordic-lca-approach>
 3. <https://www.nordicsustainableconstruction.com/events/2024/june/nordic-view-on-data-needs-and-scenario-settings-for-building-lca>
 4. <https://www.nordicsustainableconstruction.com/knowledge/2023/december/new-report-building-lca-and-bim-in-the-nordics-and-estonia>
 5. <https://www.nordicsustainableconstruction.com/knowledge/2024/september/bim-for-building-lca>
 6. <https://www.nordicsustainableconstruction.com/knowledge/2023/december/webinar-on-bim-based-lca>
 7. <https://www.nordicsustainableconstruction.com/knowledge/2024/march/new-report-regulatory-needs-for-harmonising-carbon-limit-values>
 8. <https://www.nordicsustainableconstruction.com/knowledge/2024/september/wp1-task-4-decarbonisation-of-the-building-stock>
 9. <https://www.nordicsustainableconstruction.com/events/2024/september/decarbonisation-of-the-nordic-building-stock-and-setting-limit-values>
 10. <https://www.nordicsustainableconstruction.com/knowledge/webinar-harmonised-co2-eq-limits->
 11. <https://www.nordicsustainableconstruction.com/events/2024/june/low-carbon-clinics-to-support-new-construction-projects>

Who Contributed to this Work Package?

Martin Erlandsson, Frida Görman, Åsa Thrysin, Tarja Häkkinen, Klas Eckerberg, Janne Pesu, Malin Dalborg, Johan Asplund, Sirje Vares, Jarmo Linjama, Ashraf Al Alam, Per Erik Karlsson, Eskil Mattsson, Heli Miettinen, Miia Mänttari, Frans Silvenius and Eeva-Maria Tuhkanen, Tommi Kaartinen, Allan Schiøtz, Trine Dyrstad Pettersen, Maria Balouktsi, Nicola Francart, Kai Kanafani, Anni Oviir, Anne Rønning, Ólafur Ögmundarson, Rita Lavikka, Tiina Vainio-Kaila, Markku Kiviniemi, Paula Alakotila, Mikko Kouhia, Charlotte Nyholm, Jan Karlshøj, Oddbjørn Dahlstrøm Andvik, Alexander Borg, Iselin Idunn Østvedt, Charlotta Malmén, Maximilian Von Bahr, Tomi Henttinen, Tero Järvinen, Minna Salonsaari, Anna-Riitta Kallinen, Katja Maununaho, Tytti Bruce-Hyrkäs, Harpa Birgisdóttir, Endrit Hoxha, Morten Ryberg, Christine Collin, Nicolaj Hostrup Langkjær, Anna Joelsson, Inga Sjöberg, Alexandra Kjeld, Karin Sjöstrand, Isabel Segura, Satu Kangas, Kari Nöjd, Kristina Einarsson, Maria Rydberg, Matti Kuittinen, Luzie Rück, Hannamary Seli, Þóra Margrét Þorgeirsdóttir, Inger Grethe England, Elín Þórólfsdóttir, Morten Buus, Kikki Lambrecht Ipsen, Rikke Schack, Elina Virolainen, Ahti Kooskora.



Photo: Nordic Sustainable Construction, Oslo 2022



View from Kastrup Fort, Copenhagen 2024



Circular Business Models and Procurement

Work Package 2

IN THIS CHAPTER, WE DIVE INTO:

Strengthened Nordic Competitive Capability →

Low-carbon Marine Biobased Construction Products →

Tools to Turn your Business Model from Linear to Circular →

The Power of Procurement →

A Nordic Market Platform for Reused Construction

Materials →



The structure of Work Package 2: Circular Business Models and Procurement

Nordic Smart City Network

Nordic Blue Building Alliance

Circular Business Model Workshops

Nordic Circular Toolbox

Retrade Platform

Place-Based Architecture



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We hope that we will see a rapid uptake of circular business models in the construction industry and that a strong focus on working with businesses and municipalities will foster more circular public procurement and green innovation in the construction sector.

Rasmus Malmberg, Head of Programme at Nordic Innovation – Life Science & Health Tech and Sustainable Construction, Leader of Work Package 2

Strengthened Nordic Competitive Capability

With an increased focus on sustainability in the construction sector and our society, it is imperative to explore new ways of building and living that align with our well-being, climate- and environmental goals. The development of new regenerative construction materials with lower environmental impact necessitates innovative solutions at the execution level of the sector. To effectively drive this transition, it is essential to continuously innovate and establish the right requirements in tenders, drawing inspiration from frontrunner cities, to ensure competitive strength in the Nordics.

Low-Carbon Marine Biobased Construction Products

Work Package 2 has investigated and promoted the use of marine biobased low-carbon building materials. The report *Marine Biobased Building Materials* delves into the possibilities and challenges of using materials such as algae, seagrass, and reeds in construction. Based on a broad alliance of leading companies within the field, the material developed shows that if scaled appropriately and produced with low CO₂ footprints, they could serve as viable alternatives to traditional, carbon-intensive materials. Moreover, the report emphasises that the gentle extraction of these materials could have positive effects on marine environments, adding an ecological dimension to their adoption.

The report has been part of sparking the debate about how we use our oceans in a sustainable way and what the possibilities are for finding alternative sources of building materials. The Nordic Blue Building Alliance will use this report as part of further European and international work on the potential of using marine-based building materials.



Torshavn, 2024



Trolldstigen, Norway 2016

Tools to Turn Your Business Model from Linear to Circular

Another important delivery from Work Package 2 is the Nordic Circular Economy Playbooks with instrumental tools and examples from the construction sector that companies can use to transition their business into a more circular business. The playbooks provide detailed guidance on overcoming technical challenges, exploring new business models, and scaling sustainable practices across the sector.

35 construction companies joined a series of workshops where the tools were presented to them, and they discussed and worked on how to implement them in their specific context.

Business model	Sub-model	Adoption level	Comment
CIRCULAR INPUTS	Build to last	Not applied at all Widely applied	Products are designed for long lifecycles – however, use of modular design principles is not very common yet, but being explored
	Circular supplies	Not applied at all Widely applied	Input materials are mostly recyclable (e.g. steel), while use of sustainable indirect materials, such as renewable energy, varies a lot
SHARING PLATFORM	Share	Not applied at all Widely applied	Sharing platforms are seen as challenging to implement for some products, as many of the products are fixed installations or have a high degree of customization
PRODUCT AS A SERVICE	Product as a service	Not applied at all Widely applied	Only a few companies have adopted the model, while many are currently exploring it. Some companies are finding it challenging to find an investment model and achieve a win-win situation for both customers and the company
	Performance as a service	Not applied at all Widely applied	Many companies are currently exploring the model, and some have never heard of it
PRODUCT USE EXTENSION	Repair & Maintain	Not applied at all Widely applied	Most companies provide at least some repair and maintenance services. However, some report that they are not leveraging their full potential
	Upgrade	Not applied at all Widely applied	Many companies are already applying the model, and most others are exploring how to apply it
	Resell	Not applied at all Widely applied	Companies are not seeing reselling as a relevant opportunity for products that have very long lifecycles
	Remanufacture	Not applied at all Widely applied	Remanufacturing is not seen as relevant for products with very long lifecycles
RESOURCE RECOVERY	Recycle/upcycle	Not applied at all Widely applied	Companies find it challenging to ensure recycling of products, e.g. because products might be scattered around the world, the products are not built for circularity and it is difficult to separate materials and even know the product composition
	Return	Not applied at all Widely applied	Most companies recycle some of their manufacturing waste

Table: Excerpt from the *Nordic Circular Economy Playbook – Circular Business Models for the Manufacturing Industry* showing that the current adoption level of circular models in the Nordic manufacturing industry is highest within circular inputs and product use extension.



View from Ligna Båtsällskap, Stockholm 2019

What are the Companies Saying?

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We noticed a shift in pace ten years ago when BREEAM-NOR was launched, and more recently with regard to the circular economy. Two years ago, we oriented ourselves towards circularity through the Nordic Circular Programme to learn more, and now we are starting our first circular projects. We must continuously take new steps to contribute to the necessary transformation of the construction industry.

Heather Bergsland, Veni

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I think that this holistic approach to the circular economy and how to work with it as a quite practical, tool-based approach, has been very useful. It has helped to shape our approach on how to deal with it.

Jesper Jerlang, Standardisation Manager, Danfoss Drives



Nordhavn, Copenhagen 2024

K14-04

The Power of Procurement

The work package's involvement in pilot projects in Tampere and Stavanger and, later on, experiences harvested from the City of Copenhagen and Stockholm showcase how circular principles can be successfully integrated into public procurement. These projects are not only a testament to the potential of circular construction practices but also serve as valuable case studies that can inspire and guide other cities on how to procure more circular. Three key recommendations to get started are the following:

- Focusing on life cycles, longevity, and value of materials in use: renovate, reuse, repurpose, maintain the value of materials
- Goal Setting and Accountability: Set ambitious targets, hold city managers accountable, and tie bonuses to meeting circular targets
- Tendering Process: Balance cost and competence, leave room for innovation

A Nordic Market Platform for Reused Construction Materials

The project Re-trade was initiated in mid-2024. The project aims to develop the Nordic re-trade market for circular critical construction materials in a way that can make the value chains in the construction industry more sustainable and make the circular business models for material use and modular building practices profitable and scalable on a Nordic level. By fostering the development of a Nordic re-trade market for circular critical construction materials, it supports the creation of sustainable value chains and promotes modular building practices that are both profitable and scalable. This dual focus on environmental and economic sustainability paves the way for the possibility that the construction industry can meet its climate goals without compromising its competitiveness. The project is still ongoing and you can find more information on our website.^[12]

12. <https://www.nordicsustainableconstruction.com/knowledge/2024/october/re-trade>

Overview of Deliveries

Work Package 2

Report: Circular Construction in Nordic Cities^[13]

Nordic Blue Building Alliance^[14]

Technical Handbook: Marine Biobased Building Materials^[15]

Nordic Business Tools^[16]

Nordic Circular Economy Playbook 1.0 and Nordic Circular Economy Playbook 2.0^[17]

Report: Circular Business Models in the Nordic Manufacturing Industry^[18]

Workshops on how to make your business model circular

Re-trade^[19]

Place-based architecture

13. <https://www.nordicsustainableconstruction.com/knowledge/2024/september/circular-construction-in-nordic-cities>

14. <https://www.nordicsustainableconstruction.com/news/2023/march/nordic-blue-building-alliance>

15. <https://www.nordicsustainableconstruction.com/news/2024/may/marine-biobased-building-materials>

16. <https://www.nordicinnovation.org/tools>

17. <https://www.nordicinnovation.org/2022/nordic-circular-economy-playbook-20>

18. <https://www.nordicinnovation.org/2023/circular-business-models-nordic-manufacturing-industry>

19. <https://www.nordicsustainableconstruction.com/knowledge/2024/october/re-trade>

Who Contributed to this Work Package?

Accenture, Nordic Innovation, Sitra, Nordic Smart City Network, AFRY Finland, Nordic Circular Hotspot, Natural State, Fund Forward, Center for Cirkulær Økonomi, Hringrasarsetur, Nefco, ARUP, Nordic Blue Building Alliance

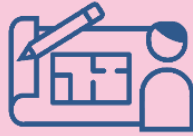
The cities of Tampere, Stavanger, Torshavn, Copenhagen and Stockholm



Tingbjerg Copenhagen, 2024



Varvstaden, Malmö 2024



Sustainable Construction Materials and Architecture

Work Package 3

IN THIS CHAPTER, WE DIVE INTO:

Enriching the Debate: What is a Sustainable Construction Material? →

Redefining Good Construction →

Prioritising Material Hierarchies in Construction →

Policy-Driven Change →

Network – the Power of Goodwill →



Form
Design
Center

SUSTAINORDIC 

The structure of Work Package 3: Sustainable Construction Materials and Architecture

Democracy Festivals –Knowledge Gathering Tour

Transformation Panel

The Hierarchy of Material Use in Construction

Place-Based Development
and Architecture

Legislation for Sustainable Construction and Architecture

The Unheard Voices in Architecture



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The Nordic countries must embrace policy changes that transcend silos. We cannot build our way to the Paris Agreement by just constructing new. The path forward requires rethinking how we use existing spaces and resources. Furthermore, we must adapt to the reality of finite planetary boundaries and make systemic reforms that address both the climate and biodiversity crises. Moving forward, it is important to work on cross-sector regulation and focus on place-based construction.

Pernille Martiny Modvig, Head of project, SUSTAINORDIC, Leader of Work Package 3

Enriching the Debate: What is a Sustainable Construction Material?

The building sector is broad and contains many types of professions and stakeholders across the value chain. In order to succeed with a sustainable transformation, a cultural, discursive transformation must take place as well. We must change what we consider the ideal home, the priorities in the way we build, and perhaps our aesthetics as well. However, there are still variations and disagreements in the way we perceive sustainability, sustainable construction materials, and solutions. That is why dialogue is a crucial tool to achieve the goal of minimising the climate and environmental impact of construction. That is the key focus area of Work Package 3.

Roundtable Discussions and Articles

Over a three-year period, the work package has had different focus areas to guide knowledge collection and analysis.

During the first phase, it focused on identifying necessary changes and barriers in the Nordic construction sector through broad knowledge generation and collaboration. Four key themes that needed to be further enriched based on debates organised across the Nordics, in Bruxelles, and at Climate Negotiations emerged:

- Material use hierarchy,
- Place-based architecture,
- Underrepresented policy interests, and
- Emission regulations.

The second phase tested solutions to these barriers with stakeholder engagement to assess feasibility. These four central topics were used to kick off the roundtable discussions, where experts with different perspectives gave their input. The findings were summarised into policy recommendations for industry leaders and decision-makers.

Redefining Good Construction

Our perception of “good” construction materials and solutions is changing. New focus areas are gaining importance, and the balance of considerations and priorities is shifting. Today, the focus has shifted from energy performance during the use phase to a whole-life carbon perspective, emphasising the extension of existing building lifespans. New considerations now come into play, including nature's interests and the intrinsic value of materials, which were previously overlooked or considered voiceless.

The findings from this work package emphasise the need for a cultural shift toward systems thinking and life-centric policies, fostering long-term sustainability across education, urban planning, and policy-making.

It calls for promoting lifelong systems thinking and shifting from *human*-centric to *life*-centric policies by integrating biodiversity and sustainability into urban planning. Additionally, it encourages community involvement, regenerative development, and the establishment of stronger legal frameworks for land use and biodiversity protection. Actively involving youth in sustainability decisions and ensuring their voices shape policy and legislation, is also critical. Furthermore, collaboration at local, national, and international levels is essential to effectively address climate adaptation and environmental challenges.



Peatlands are vital ecosystems that play a crucial role in carbon storage, water regulation, and supporting biodiversity. In construction, it is essential to consider not only the direct impact on the land but also the wider effects on surrounding ecosystems. Protecting peatlands and other natural landscapes ensures that both on-site and off-site biodiversity is preserved, helping to maintain ecological balance and mitigate climate change. Sustainable land use practices in construction are key to safeguarding these critical ecosystems for future generations. Photo: Peatland, Kristiina Lång

Work Package 3 has supported the transformation of construction by investigating the concept of place-based architecture and the underrepresented voices in construction. These topics point to a way of designing buildings that are deeply responsive to their local environments. This includes considering factors such as local material availability, cultural and aesthetic contexts, and the broader environmental impact of construction, as well as advocating for more inclusive, community-centred approaches to planning and building. By promoting place-based design and including diverse perspectives, Work Package 3 has fostered a broader conversation about how architecture can contribute to community resilience and a more holistic view of sustainability, encouraging architects and developers to think more critically about the environmental and social implications of their projects.

Prioritising Material Hierarchies in Construction

Another area in which Work Package 3 has initiated and enriched the debate, is the question of what is a sustainable material. Is the most sustainable construction material, in reality, the one that we avoid using? One of the most significant contributions to this debate from this work package has been the advocacy for material hierarchies. This approach encourages the construction industry to prioritise retrofitting and repurposing existing buildings over new construction, which is often more resource-intensive. When new construction is necessary, the emphasis is on using renewable, biobased materials rather than traditional, high-impact options like concrete and steel. This shift in focus has sparked important discussions about how the sector can reduce its overall carbon footprint by rethinking material use.

The findings under this work package point to the need to prioritise sustainability in construction through policies that limit demolition, encourage retrofitting, and promote the use of reused and biobased materials. It calls for integrating material reuse into design processes, adjusting housing policies to better utilise existing spaces, and providing education on sustainable building practices. Additionally, it highlights the importance of data sharing, lifelong training, and creating systems for reusing materials, all aimed at reducing environmental impact and supporting long-term ecological health.

This work has resulted in four fundamental recommendations:

- Limit demolition and prioritise preservation, renovation, and retrofitting of existing buildings.
- Promote the use of reused materials in design and construction and use biobased materials when virgin material cannot be avoided.
- Encourage flexible housing solutions by optimising existing spaces and revising housing policies.
- Implement mandatory education and training on sustainability across the construction sector.

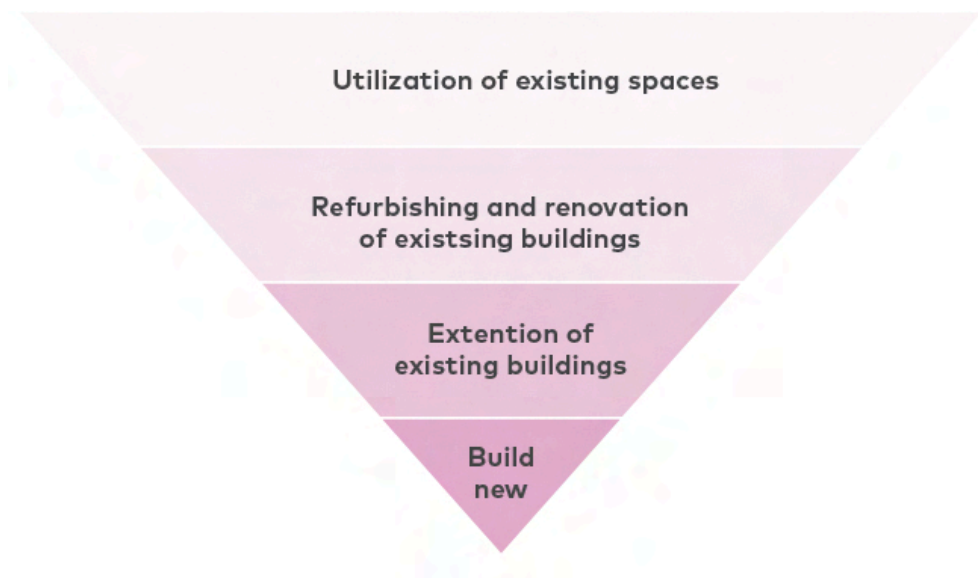


Figure: Hierarchy for resource-efficient construction, Matti Kuittinen, Aalto University

Gathering the Sector to Discuss Innovative Solutions at the United International Architects Congress

A way of fostering international collaboration and knowledge sharing is through conferences that spark conversation across the construction sector in different countries. Through the involvement in the global UIA World Congress of Architects, Work Package 3 managed to do just that. The event held in Copenhagen 2023, was a significant platform for highlighting the Nordic region's commitment to sustainable architecture and materials. The pavilion featured innovative projects that demonstrated how sustainable construction could be achieved through the integration of local materials, renewable resources, and circular design principles.



Policy Session at the Nordic Pavilion, UIA 2023: Legislation for regenerative architecture – Is carbon budget a game changer? Photo: Nordic Sustainable Construction



UIA 2023 CPH WORLD CONGRESS OF ARCHITECTS Photo: Nordic Sustainable Construction



THE NORDIC PAVILION

Collaborated for a
regenerative future

MONDAY

Theme: Understanding legislation for a
regenerative future - encouraging
multistakeholder involvement in policy making

11:00 - 11:30
OPENING OF THE NORDIC PAVILION

11:30 - 12:00
LEGISLATION FOR REGENERATIVE
ARCHITECTURE - IS CARBON-BUDGET
A GAME CHANGER?

12:00 - 12:30
NEW NORDIC BUSINESS - HOW WILL
WE LIVE IN A CARBON-NEUTRAL
WORLD IN 2050?

12:30 - 13:00
NEW NORDIC ARCHITECTURE FOR
THE FUTURE - THAT AND CLIMATE-RESILIENT

13:00 - 13:30
NORDIC RECEPTION AT THE GARDEN
ASSOCIATION OF ARCHITECTS

13:30 - 14:00
TUESDAY

Theme: Urban future development and
architecture as a community builder

14:00 - 14:30
REGENERATIVE LEADERSHIP

14:30 - 15:00
CITY ARCHITECTS REGENERATIVE
CITIES FOR THE FUTURE

15:00 - 15:30
Theme: The urban future in
architecture and construction policy

15:30 - 16:00
COLLABORATE FOR A REGENERATIVE
FUTURE - HEARING ALL VOICES

16:00 - 16:30
BEHIND THE BUILDING MATERIAL
TO MARKET

WEDNESDAY

Theme: Values and perspectives

10:00 - 10:30
BUILDING IN THE WILDERNESS - A
PARADOX? DESIGN IN NATURE -

10:30 - 11:00
NATURE AS A DESIGN INSPIRATION

11:00 - 11:30
NATURE AS A DESIGN INSPIRATION
- THAT AND CLIMATE-RESILIENT

11:30 - 12:00
DESIGN IN NATURE - THAT AND

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The Nordic Pavilion at UIA 2023 CPH WORLD CONGRESS OF ARCHITECTS Photo: Nordic Sustainable Construction

Policy-Driven Change

Another significant way that Work Package 3 has contributed to and broadened the debate is through its focus on legislative reform. By leading discussions and making recommendations on how laws and regulations can better support sustainable construction practices, the work package has brought to light the crucial role that policy plays in driving industry-wide change. The emphasis on integrating sustainability principles into building codes and construction standards has added an essential dimension to the sustainability discourse, highlighting the need for legislative support in promoting circular practices and long-term environmental stewardship.

With the aim of engaging a wider audience and pushing for new agendas, this work package has worked on involving decision-makers, thought leaders, and similar actors to activate a greater shift towards a Nordic housing and construction sector with minimal environmental and climate impacts.

This involvement is based on the belief that the barriers to this shift are equally driven by mental habits and beliefs as well as by legislative, structural, and financial norms. The notion is that a balance between these internal and external factors is essential. If Nordic countries can strike this balance, they will be better equipped to meet growing climate demands - demands that, in many ways, have been driven by the electorate and the construction sector itself, through roadmaps, climate marches, and other collaborative initiatives.



Photo: Pernille Martiny Modvig, Discussion at democracy festival tour, Folkemødet Bornholm 2022

Network – The Power of Goodwill

Through debates, roundtable discussions, interviews, and network meetings Work Package 3 has engaged with 116 experts and practitioners connected to the value chains related to construction and housing in the Nordics and beyond.

Apart from these 116 experts, over 800 participants have participated in events and debates hosted by Work Package 3.





Banegaarden, Copenhagen 2024

Overview of Deliveries

Work Package 3

Democracy Festivals – Knowledge Gathering Tour^[20]

Participated in eight events

Nordic Pavilion at UIA 2023^[21]

Transformation Panel

Article^[22] and Roundtable Discussion^[23] on the Hierarchy of Material Use in Construction

Article^[24] and Roundtable Discussion^[25] on Place-Based Development and Architecture

Article^[26] and Roundtable Discussion^[27] on Legislation for Sustainable Construction and Architecture

Article and Roundtable Discussion on the Unheard Voices in Architecture^[28]

Final Article and recommendations to the Nordic Vision 2030: Future-Proofing Nordic Construction - Policy Paths for Building within the Safe Operating Space^[29]

-
20. <https://www.nordicsustainableconstruction.com/knowledge-centre/debates-and-articles-on-sustainable-construction-materials-and-architecture>
 21. <https://www.nordicsustainableconstruction.com/news/2023/july/policy-session-at-the-nordic-pavilion-uia-2023>
 22. <https://www.nordicsustainableconstruction.com/knowledge/2024/august/material-hierarchies>
 23. <https://www.nordicsustainableconstruction.com/news/2023/december/roundtable-discussion-on-materiale-hierarchy->
 24. <https://www.nordicsustainableconstruction.com/news/2024/february/article-placed-based-architecture>
 25. <https://www.nordicsustainableconstruction.com/news/2024/february/roundtable-discussion-placebased-architecture>
 26. <https://www.nordicsustainableconstruction.com/knowledge/2024/may/legislation-and-policies-to-pave-the-way-for-sustainable-architecture>
 27. <https://www.nordicsustainableconstruction.com/news/2024/may/roundtable-for-sustainable-construction>
 28. <https://www.nordicsustainableconstruction.com/news/2024/june/down-to-earth>
 29. <https://www.nordicsustainableconstruction.com/knowledge/2024/november/future-proofing-nordic-construction>

Who Contributed to this Work Package?

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Photo: Nordic Sustainable Construction, Oslo 2024



Photo: Mads Schmidt Rasmussen/norden.org





Photo: Róbert Magnússon,
Hjállabraut 49, Hfj. Construction site, Iceland, winter 2024



Emission-Free Construction Sites

Work Package 4

IN THIS CHAPTER, WE DIVE INTO:

Strengthened Focus on Emission-Free Construction Sites →

Practical Insights from Field Excursions →

Creating a Common Understanding and Framework →

Identifying Gaps in Existing Knowledge →

Transitioning to Emission-Free Construction: Standards
and Practical Tools →

Increased Political Focus and Support at a High Level →



The structure of Work

Package 4: Emission-Free Construction Sites

TASK 1

Nordic Declaration on Emission-Free Construction Sites

Task 2

Definitions, Boundaries and Terminology

Task 3

Newsletter

Task 4

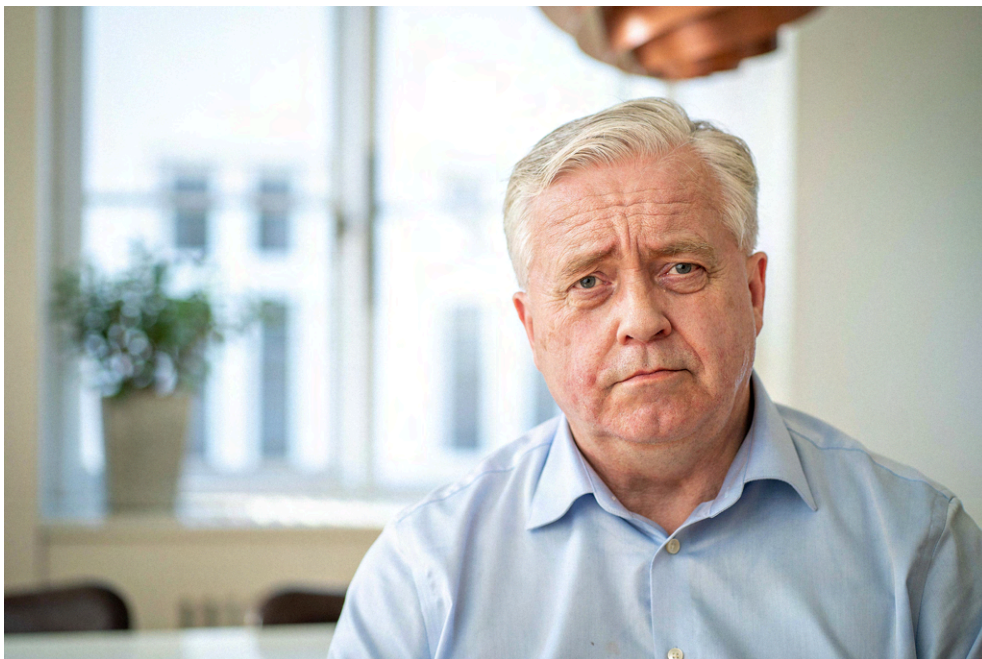
Research and Innovation

Task 5

Guidelines for Emission-Free Construction Sites

Task 6

Standards, rules and regulations that can be hindering and other barriers



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Decarbonisation of the construction site is now on the agenda along with building materials and operational emissions. We have gathered knowledge and insights from the Nordic construction industry and formed a framework for further work in this area. It is interesting that tackling construction site emissions is more than switching to electric excavators, it also involves the subjects from all the other work packages in the project.

Björn Karlsson, Senior Advisor from Ministry of Infrastructure Iceland and Leader of Work Package 4

Strengthened Focus on Emission-Free Construction Sites

What are emission-free construction sites? An obvious area to focus on when trying to decrease carbon emissions in the construction phase is the machinery – going from diesel-driven to electric construction machines. However, it became clear that more areas should focus on achieving the goal of an emission-free construction site: barriers also exist within effective processes, waste management, energy use, and procurement.

[Watch videos from the field excursions here.](#)

Practical Insights from Field Excursions

One of the key activities at the beginning of the process was a field excursion, which gave significant insights and practical results. This hands-on experience allowed the work package to identify and elaborate on the necessary means to achieve emission-free construction sites. The excursion highlighted the importance of integrating various sustainable practices and technologies to reduce emissions comprehensively. From the site visit, it became evident that comparing different approaches is essential to determining the best strategies for minimising emissions. Additionally, the importance of documenting these reductions was underscored, as proper record-keeping ensures transparency and facilitates progress tracking.

The visit also showcased innovative possibilities for reusing entire buildings to reduce environmental impact. Instead of demolishing an old structure, a higher building was added to the existing one, demonstrating how adaptive reuse can minimise material waste and emissions. This visit provided a solid foundation for the projects that followed, equipping the team with practical insights and strategies for advancing emission-free construction practices.



Photo: Klimaetaten, Oslo Kommune, screenshot from video, Norway 2023

Creating a Common Understanding and Framework

To continue the work, it was important to get a common understanding of what an emission-free construction site is. The report "Emission-free Construction Sites: Definitions, Boundaries, and Terminology" provides a unified framework for understanding what constitutes an emission-free construction site. It addresses the definitions of construction sites and their boundaries, the problems associated with emissions, waste, and pollution, and practical implementations for energy use and procurement. This report has been useful in standardising terminology and setting clear boundaries, which is crucial for consistent application across Nordic countries when including the A4 and A5 modules of the LCA calculation.

A common idea behind emission-free construction sites was to eliminate the use of fossil fuels and promote emission-free technologies, such as electric machinery. To align with common LCA practices, the scope was expanded to include aspects such as transportation and construction waste. Additionally, the report discusses the differences between fossil-free, emission-free, and waste-free construction sites, helping to clarify these concepts.

		Equipment and activities	Sources of emissions
A4	Transportation	Vehicles	Fossil fuels Renewable energy
A5.E	Energy	Construction machinery Vehicles on site Power generation	Fossil fuels Renewable energy
		Heating and drying Lighting and appliances Electric tools and machines	Fossil fuels Renewable energy District heating
A5.W	Waste	Production of waste materials Transport of waste materials Recycling Landfill	Raw materials and production Fossil fuels Renewable energy Waste processing Landfill emissions

Table: Categories of emissions from the construction site

Identifying Gaps in Existing Knowledge

To continue the journey towards greener construction sites, Work Package 4 was to identify areas where there is insufficient research or understanding of emission-free construction sites in the Nordics. The report “Emission-free Construction Sites: Knowledge Gaps and Research Needs” does this, highlighting the urgent need for extensive research, testing, and pilot projects to address greenhouse gas emissions in construction. It identifies key areas where data is lacking, such as transport-related emissions and waste, and proposes methods to enhance data collection. The report also emphasises the importance of harmonising Life Cycle Assessment (LCA) methodologies across the Nordic countries and optimising energy efficiency in construction processes.

The impact of the two reports has been significant in creating a common understanding, as they have not only provided a clearer picture of the current challenges but also laid out a roadmap for future research and innovation. By addressing what we already know as well as the knowledge gaps, the reports have paved the way for more informed decision-making and have fostered greater collaboration among stakeholders in the construction industry.

For the guidelines report, estimated emissions values for stages A4 and A5 have been collected from the Nordic countries. These figures are intended to reflect current emission levels and are expected to evolve as more accurate data becomes available. While it is insightful to see these values compiled, it is important to note that the underlying activities vary across cases. The activities included within the system boundaries differ, and the definitions of areas and units are not standardised. Harmonising standards and methods for estimating and regulating emissions is an important goal. Emissions from energy use are typically included, as this is a well-understood factor. However, emerging research shows that waste is just as important when considering construction emissions.



Photo: Róbert Magnússon, Hjallabraut 49, Hfj. Construction site, Iceland, summer 2024

	A4 (kg CO ₂ e/m ²)	A5 (kg CO ₂ e/m ²)	
Iceland	19.79	42.50	Generic values for LCAs ^[7]
Norway	LCA databases +25%		Byggeteknisk forskrift TEK17 ^[8]
Denmark	20.50	50.00	BUILD Report ^[6]
Denmark	75.00		National strategy ^[4]
Sweden	44.00		KTH and Boverket ^[9]
Finland	20.40	50.00-59.00	Generic values for LCAs ^[10]

Finland: Generic values for LCAs^[30]

Table: Estimated emissions values for A4 and A5 in the Nordic countries. From the report *Guidelines to Emission-Free Construction Sites: Recommended data to collect from the construction phase*.

30. 'Emissions database for construction', Emissions database for construction. Accessed: Jun. 30, 2024. [Online]. Available: <https://co2data.fi/rakentaminen/#en>

LCA module	Activity	What to consider	Values	How to measure	Stakeholders
A4	Transportation	Transport of materials, products, and equipment to the construction site from: -Manufacturer -Storage/-warehouse -Retailer	-Distance -Energy source	-Verification (of energy source) -Travel logs	Suppliers Material, product, and equipment hauliers
A5.E	Energy use	Emissions from: machinery	Type of machinery Energy source Amount	Verification (of energy source and worked hours)	Suppliers Sub-contractors
		Heating and cooling: -district heating -power station sources (for temporary works or other processes)	Energy source Amount	Automatic or manual meter reading Verification	Utility providers
A5.W	Waste	Construction waste:	-Volume -Weight -Type	-Waste management company reports or verification	Waste hauliers
		Transport of waste from construction site	-Distance -Energy source	-Verification	Waste hauliers

Table: Recommended data to collect for measuring emissions from transportation, energy use, and waste during the construction phase.



Construction site in Copenhagen, 2024

Transitioning to Emission-Free Construction: Standards and Practical Tools

To operationalise the work and draw a clear path, Work Package 4 has also provided guidelines for planning, procuring, implementing and evaluating emission-free construction sites. These guidelines are crucial for stakeholders aiming to implement sustainable practices effectively. Additionally, the team has been working on a report that addresses the standards, rules, and regulations that can be hindering. Furthermore, Work Package 4 has developed practical tools to support stakeholders in their efforts to achieve emission-free construction sites. This includes a cost-effective calculator designed to help stakeholders evaluate the financial implications of adopting sustainable practices. Lastly, a newsletter keeps everyone interested up to date and acts as a platform for relevant stakeholders.

Key Results About Emission-Free Construction Sites

1.

Data Gaps Hinder Emission Reduction Efforts

One of the key findings from this work package is that planning ahead and engaging designers, architects, and urban planners early in the process is essential to reducing emissions from construction sites. By considering emissions from construction waste, material transportation, on-site heating, and machinery fuel use, they can implement strategies that minimise environmental impact throughout the construction phase.

2.

Early Engagement Reduces Construction Emissions

Another key result is the conclusion that a major barrier to reducing emissions from construction sites is the lack of, both, reliable data and knowledge. Without data, it is difficult to identify key areas to target, and the lack of awareness among stakeholders often leads them to overlook the need for emission reduction efforts altogether.

Increased Political Focus and Support at a High Level

In September 2023, the Nordic Ministers of Housing and Construction gathered in Iceland. Here, they recommitted in a declaration to a common Nordic effort on reducing climate impact from construction and housing. Nordic Sustainable Construction Work Package 4 laid the groundwork behind the declaration, achieving their goal of an increased political focus on emissions from Nordic construction sites.

The declaration stated the Nordic Ministers' commitment to continue Nordic collaboration on lowering the climate impact and GHG emissions from buildings, waste, construction sites, building materials, the existing building stock, and construction processes.

The declaration also reaffirmed the Nordic Ministers' wish to harmonise relevant legislation, tools, data, methods, and policies regarding carbon neutrality in the built environment across the Nordics, following the principles of a recent roadmap developed by Nordic Sustainable Construction.

The Ministers of Construction and Housing from Denmark, Sweden, Åland, Finland, Norway, Iceland, Greenland, and the Faroe Islands approved the declaration.

It has become increasingly clear that the regulatory tightening of climate demands and limit values will increase the demands for the construction process in the Nordic countries in the coming years.



Group photo from the meeting with the Nordic Ministers of Housing and Construction, Reykjavik, Iceland 2023

We, the Nordic ministers responsible for construction and housing:

Affirm our commitment to fight climate change by facilitating reductions in emissions from the built environment. Further, we state our commitment to work towards making the Nordic construction sector the most sustainable in the world.

Recognise that the construction sector has a significant environmental impact, and that buildings affect the climate throughout their lifespan. At the same time, we recognise the construction sector's potential to play a major part in the transition to a sustainable future.

Call for collaboration in the search for low carbon solutions in the Nordic construction sector, through Nordic co-operation and harmonisation where possible.

Acknowledge the need to reduce the emissions and waste from the construction process, and work towards emission free construction sites.

Will work towards reducing greenhouse gas emissions from building materials.
Recognise the potential in preserving and developing existing building stock as a contribution to reduced emissions.

Reaffirm our commitment to continue our collaboration on harmonising relevant regulations, methods, data, tools, and policies for carbon neutrality in the built environment, in accordance with the basic principles of a Roadmap, jointly developed within the Nordic Sustainable Construction network.

Call for continued collaboration on establishing a common framework for calculating greenhouse gas emissions in building projects.

Recognise that using and enhancing EU initiatives, can contribute to making the Nordic countries the most sustainable region in the world.

Call for continued Nordic collaboration on developing a framework for facilitating the circular economy in the building sector. Stress the importance of continuing and strengthening Nordic collaboration.

By signing this declaration, we reaffirm our commitment to the ongoing work towards low carbon solutions and the integration of circular principles in the Nordic construction and building sector.

Approved in 2023 by:

Pernille Rosenkrantz Theil, Former Minister for Social Affairs and Housing, Denmark

Sigurður Ingi Jóhannsson, Minister of Infrastructure, Iceland

Kai Mykkänen, Minister of the Environment and Climate Change, Finland

Sigbjørn Gjelsvik, Former Minister of Local Government, Norway

Andreas Carlson, Minister of Infrastructure and Housing, Sweden

Harry Jansson, Minister of Housing, Åland Islands

Ingilín D. Strøm, Minister of Environment and Housing, Faroe Islands

Erik Jensen, Minister of Infrastructure and Housing, Greenland

Overview of Deliveries

Work Package 4

Task 1: Nordic Declaration on Emission-Free Construction Sites

Declaration was signed by the Nordic Ministers

Declaration introduced

Task 2: Definitions, Boundaries and Terminology

Report: Emission-Free Construction Sites: Definitions, Boundaries and Terminology – Current Status in the Nordic Countries^[31]

Webinar: Emission-Free Construction Sites: Definitions, Boundaries and Terminology – Current Status in the Nordic Countries

Brochure: Emission-Free Construction Sites: Definitions, Boundaries and Terminology – Current Status in the Nordic Countries^[32]

Task 3: Network

Newsletters^[33]

Excursion to emission-free construction sites^[34]

Task 4: Research and Innovation

Report: Knowledge Gaps and Research Needs^[35]

Webinar: Knowledge Gaps and Research Needs^[36]

Cost-Effectiveness Calculator^[37]

Task 5: Guidelines for Emission-Free Construction Sites

Report: Guidelines for Emission-Free Construction Sites^[38]

Launch webinar: Guidelines for Emission-Free Construction Sites^[39]

Guidelines brochure

Task 6: Standards, Rules and Regulations that can be Hindering and Other Barriers

Report published ultimo 2024

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31. <https://www.nordicsustainableconstruction.com/knowledge/2023/march/report-on-emission-free-construction-sites>
 32. <https://www.nordicsustainableconstruction.com/knowledge/2023/june/pamphlet-emission-free-construction-sites>
 33. <https://us21.campaign-archive.com/home/?u=b9da17117cf48ab43b0017434&id=548844b400>
 34. <https://www.nordicsustainableconstruction.com/knowledge/2023/march/green-construction-site-of-the-future-mindet-6>
 35. <https://www.nordicsustainableconstruction.com/knowledge/2024/january/emission-free-construction-sites>
 36. <https://www.nordicsustainableconstruction.com/knowledge/2024/knowledge-gaps-and-research-needs-emission-free-construction-sites>
 37. <https://www.nordicsustainableconstruction.com/news/2024/february/calculator-for-electric-machinery-cost-effectiveness>
 38. <https://www.nordicsustainableconstruction.com/knowledge/2024/september/guidelines-for-emission-free-construction-sites>
 39. <https://www.nordicsustainableconstruction.com/events/2024/september/webinar-guidelines-for-emmission-free-construction-sites>

Who Contributed to this Work Package?

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Construction site, Østerbro, Copenhagen 2024



"Lunden" restaurant, Nørrebro, Copenhagen 2024



Competences for Reuse in Construction and Programme Secretariat Work Package 5

IN THIS CHAPTER, WE DIVE INTO:

- Enhancing the Competences for Reuse in Construction →
Vocational Schools as a Foundation for a Green Transition
→
- Policies Enabling Reuse in Construction →
- The Educational Material: Skills4Reuse →
- Creating Links and Engaging Stakeholders →
- Event highlights: Nordic Climate Forum for Construction.
Sector Workshop. Level(s) Webinar →
- Communication Partners →



 Danish Authority of
Social Services and Housing

The structure of Work Package 5: Competences for Reuse in Construction and Programme Secretariat

Competences for Reuse in Construction

Creating Links and Engaging Stakeholders

Programme Secretariat



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To accelerate the green transition path the construction sector is on, we need to learn from each other and together create new knowledge and the needed skills. This is only possible when we have a strong collaboration across the whole value chain and across borders. Work Package 5 has contributed with hands-on educational materials that are already being used in several countries. Furthermore, we have ensured that the vast knowledge generated in all the work packages has been shared with other stakeholders who are also on the green transition path – both across the Nordic region, Europe and beyond.

Helle Redder Momsen, Head of Secretariat and leader of Work Package 5

Enhancing the Competences for Reuse in Construction

The shift towards sustainable construction practices demands new skills, such as knowledge of resource-efficient building techniques, how to utilise materials that are already there or could be reused somewhere else and how to build for disassembly.

There is a significant need for updated training programmes and educational curricula to equip students and workers with the necessary green skills. With new legislation limiting the climate and resource impact from construction, the adoption of sustainable materials and new ways of building, there is a need for workers to continuously update their skills.

Vocational Schools as a Foundation for the Green Transition

Addressing these challenges is crucial for the construction sector to successfully transition to greener practices and contribute to broader environmental goals. Through the project Competences for Reuse in Construction, Work Package 5 is contributing to strengthening teachers at vocational schools in their knowledge of reuse, sustainability, and circularity. The project was [initiated in January 2023](#) and carried out in collaboration with Norion Consult and Videnscenter for Håndværk og Bæredygtighed (Knowledge Centre for Handcraft and Sustainability).



Group photo of the project team from the first meeting, January 2023

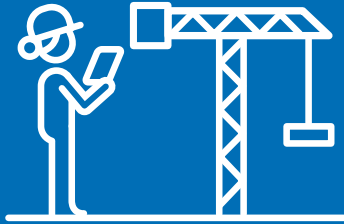
Policies Enabling Reuse in Construction

The first and foundational step in the project was to investigate what educational materials on reuse already existed in the Nordic countries. This resulted in a comprehensive mapping of the current educational material related to sustainable construction. No material was found on how to build with reused products, hence this became the focus of the teaching material.

To enable the take up of building with reused construction products, a report was made mapping and analysing the legislative barriers and potentials for reusing building materials in the Nordic building regulations. The report identified the following four key Enablers for the Reuse of Construction Products:



Århusgade in Nordhavn, Copenhagen 2024



Improved Building Design

Design for circularity properties includes designing for flexibility and adaptability, designing for disassembly, and designing long-lasting buildings. By introducing legislative requirements for circular design, the potential to reuse buildings, construction products and materials in the buildings' end-of-life are increased. This contributes to waste and emission reductions and reduced use of raw materials.

Required Documentation of the Environmental Impact of New Construction

Circular construction practices are promoted by requiring documentation of the total green house gas emissions from new construction. For example, this can contribute to promoting renovation and using low-carbon materials such as reused construction products. When no EPDs (Environmental Product Declaration) are available for used construction products, emissions from the relevant modules in the life cycle assessment should be assigned to zero rather than to similar emissions as in new products. Otherwise, reuse will be disincentivised. As data on reused construction products and the preparation of reuse is developed, these emissions can be included to provide more accurate information.

Carbon Limit Values

The construction industry is responsible for a large portion of the total global carbon emissions. Setting carbon emissions limit values encourages using low-carbon materials such as reused construction products and secondary raw materials. This will create incentives for circular construction, thereby reducing the carbon footprint of buildings and infrastructure.

Clear Definitions

New policy initiatives and targets must refer to a clear definition of reuse that differentiates from recycling. In general, all new policies on circularity must be followed by sufficient interpretation guidance and practical examples.

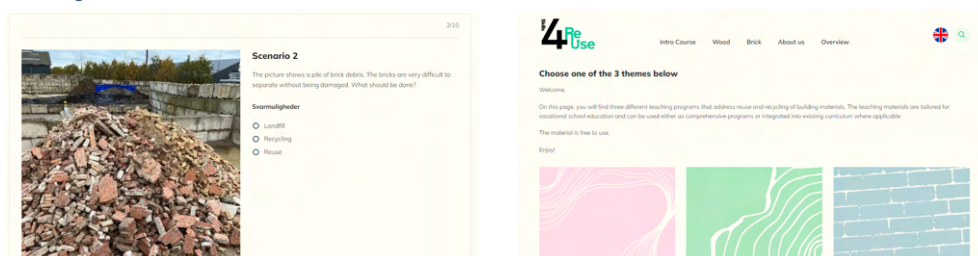
The report also resulted in a closer dialogue amongst the Nordic construction authorities, whom saw a common importance in ensuring that reused products would be part of the revised Construction Product Regulation from the EU.

The Educational Materials: Skills4Reuse

After the mapping and analysis, the free educational platform Skills4Reuse was developed and disseminated to Nordic vocational schools. Skills4Reuse consists of three courses: An introduction to sustainability, and two courses focusing on the reuse of wood and brick. The material includes text, assignments, videos, quizzes and practical building exercises.



Screenshots from the webpage of Skills4Reuse: Front page, categorise, and an example of an assignment



In connection with the dissemination of Skills4Reuse, the team behind this has participated in a variety of events including the HÅNDVÆRK festival, conferences for vocational teachers, and Byggforum. Here are some statements from students and educators after testing Skills4Reuse:

”

“There are teacher’s guides available with learning targets and everything! A true gift to the educator.

– Teacher

”

It has a good introduction to topics such as LCA that can be complicated to understand. When the students are working with the assignments, it gives me the freedom to look around and offer my assistance to those who get stuck.

– Teacher

”

The material deals with what concerns me as a craftsman and that interested me.

– Student

”

The fact that the material constantly draws parallels to our workday, that’s what keeps me engaged! That’s what we’re here for!

– Student

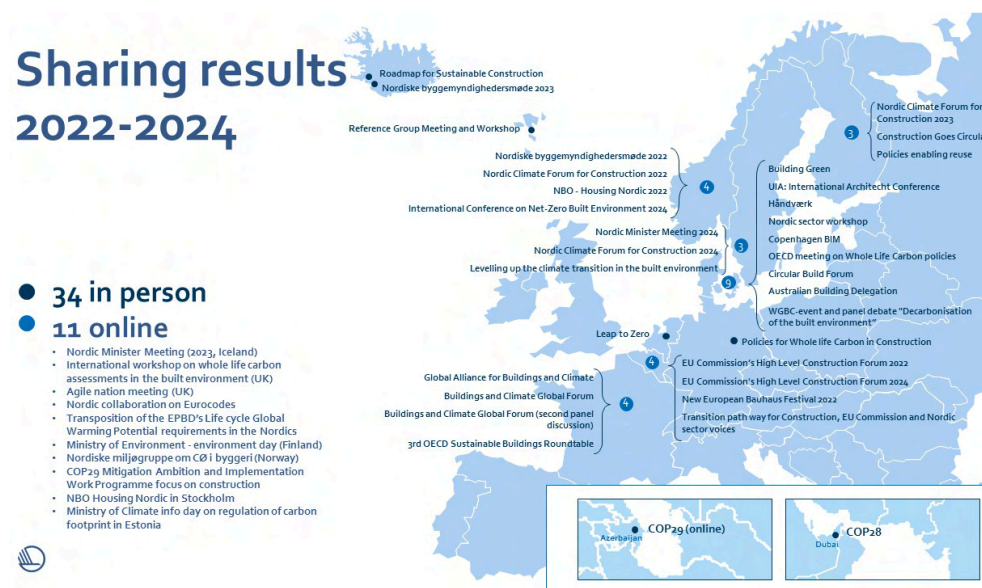


Presenting Skills4Reuse at conferences and teachers' seminar



Creating Links and Engaging Stakeholders

An important task of the Secretariat for the whole programme has been to communicate the results of the programme to relevant stakeholders. To do this, Work Package 5 has presented at events all across the Nordics, in the EU and beyond.



Event Highlights

Nordic Climate Forum for Construction

Nordic Climate Forum for Construction is an annual forum that focuses on the climate impact of the construction sector in the Nordic countries and Estonia. The forum brings together scientists, policymakers, industry experts, and stakeholders to discuss and share updates on regulations, best practices, and innovations aimed at reducing the environmental footprint of construction activities.



Sector Workshop

In June 2024, Nordic Sustainable Construction gathered stakeholders from across the Nordic construction sector. The aim was to share their knowledge on trends and initiatives happening in the Nordics, EU, and beyond, and to give input to a new potential Nordic construction collaboration from 2025–2030.



One of the main objectives was to discuss the content of a potential new Nordic collaboration on sustainable construction. Therefore, the participants gave their input on this at a workshop. They discussed four themes defined by the Nordic Ministers of Housing and Construction: Climate, Circularity and Digitalisation. The fourth theme was EU, which was discussed as a cross-cutting theme.



Webinar: Level(s) and the New Energy Performance of Buildings Directive

The European Commission hosted this webinar in June 2024 to highlight the benefits of using Level(s) – the EU assessment and reporting tool for the sustainability performance of buildings. Revisions to the Energy Performance of Buildings Directive in 2024 underlined the benefits of Level(s), since, as part of the revised rules adopted in April, building professionals will need to disclose the global warming potential (GWP) of new buildings on energy performance certificates using a calculation measure drawn from Level(s). The updated rules will come into effect from 2028 for new buildings with a useful floor area larger than 1000 m². From 2030, they will apply to all new buildings.

Nordic Sustainable Construction presented the status of implementation of regulating embodied carbon throughout the life cycle in the Nordic countries and Estonia and furthermore elaborated on the key lessons learned when putting the demands into regulation and other results from the whole programme.

Interested in learning more?

All the results and information on Whole Life Carbon, circularity, sustainable construction materials, skills, construction sites and much more can be found in the Knowledge Center^[40] on Nordic Sustainable Construction's website.^[41]

You can also follow the programme on LinkedIn^[42] or sign up for our newsletter^[43] to get the latest information.

Communication Partners

To ensure that the results from the Nordic Sustainable Construction Programme are reaching the industry, we are collaborating with significant stakeholder voices in each of the Nordic countries. We call them our communication partners.

The communication partners meet four times a year to get an update on the latest results from the programme, share their knowledge and experiences with each other, and get inspired.

The communication partners are:

- Bärkraft (Åland)
- Byggevareindustrien Norway (Construction Products Norway)
- Danish Construction Federation
- DK-GBC (Rådet for Bæredygtigt Byggeri)
- Federation of Icelandic Industries
- GBC Finland
- House of Industry (Faeroe Islands)
- Swedish Construction Federation

40. <https://www.nordicsustainableconstruction.com/knowledge-centre/debates-and-articles-on-sustainable-construction-materials-and-architecture>

41. <https://www.nordicsustainableconstruction.com/>

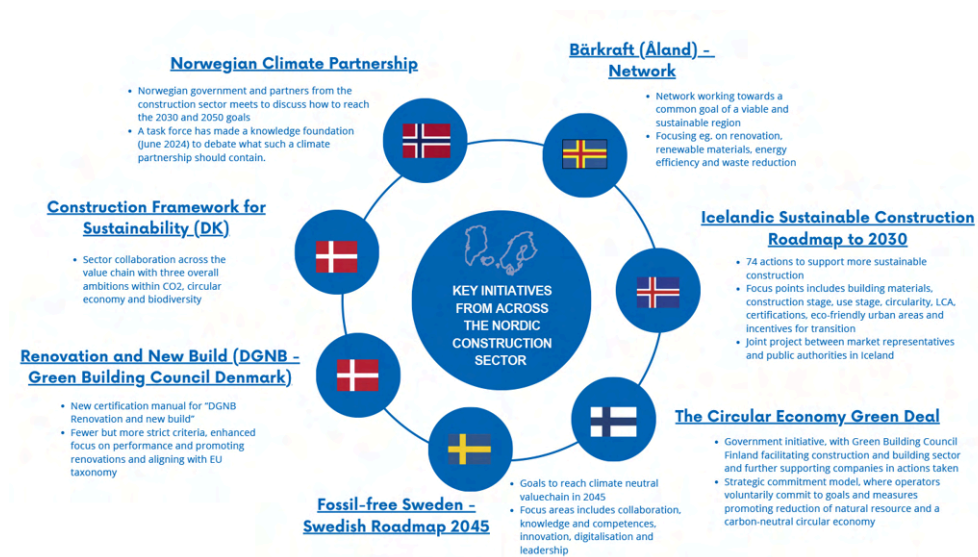
42. <https://dk.linkedin.com/company/nordicsustainableconstruction>

43. <https://nordicsustainableconstruction.us1.list-manage.com/subscribe?u=eff8f6544418d8238727d26b6&id=1ac30a82cb>



Photo: Helle Redder Momsen, Communication partner's site visit, Usquare in Brussels, 2024

One of the key findings in how to accelerate the transition in the construction sector, has been to engage the construction industry. As part of the knowledge exchange Work Package 5 has made an overview of ongoing initiatives where the communication partners have been directly involved.



Overview of Nordic construction sector initiatives, November 2024.

Source: <https://www.nordicsustainableconstruction.com/knowledge/2024/september/nordic-sector-initiatives>

Overview of Deliveries

Work Package 5

Skills4Reuse

Report: Policies Enabling Reuse in Construction^[44]

Mapping of Educational Material^[45]

Website: Skills4Reuse^[46]

Nordic collaboration on harmonisation and a green optimisation of the national annexes to the Eurocodes

Participation at 11 events online and 34 events with physical attendance to get the results from the programme out

Sector workshop

Nordic Sustainable Construction Symposium

44. <https://www.nordicsustainableconstruction.com/knowledge/2023/july/policy-report-2023>

45. <https://www.nordicsustainableconstruction.com/knowledge/2023/mapping-of-education-materials-on-reuse-of-construction-products>

46. www.skills4reuse.com

Who Contributed to this Work Package?

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Hamborg Plads, Copenhagen 2024



Photo: Coco Krusbæk, Faroe Islands, Tjørnuvík, 2024

Who is Behind Nordic Sustainable Construction?

All the outputs listed above in this Toolbox are a result of close collaboration between various contributors that combined make up the programme of Nordic Sustainable Construction:

Work Package Leaders 1–5

- **Finland:** Finish Ministry of the Environment
- **Norway:** Nordic Innovation
- **Sweden:** Form/Design Center
- **Iceland:** Ministry of Infrastructure and Green Building Council Iceland
- **Denmark:** Danish Authority of Social Services and Housing

Nordic Innovation, an organisation under The Nordic Council of Ministers, funds the collaboration.

The Nordic Harmonisation Steering Group

To ensure the continued Nordic collaboration on harmonising building regulations and a joint Nordic construction sector, the Nordic Ministers for Construction and Housing have mandated a steering group for harmonisation of regulation, which also follows our programme.

The Reference Group

To ensure that the knowledge, findings, and progress of the programme are anchored in the Nordic countries, a reference group has been appointed which has followed and contributed to the programme since 2021.

The reference group consists of the work package leaders and government representatives from Denmark, Finland, Norway, Iceland, Sweden, Faeroe Islands, Greenland and Åland and furthermore representatives from frontrunning organisations and stakeholders, such as Nordic Innovation and Form/Design Center.

The group meets four times a year to share the latest results from the work packages, get inspiration from real-life projects and thought leaders, hear news from the secretariat and discuss relevant topics.



The reference group contributes with valuable discussions on the work and progress being done to transform the construction sector in a more green direction across the Nordic countries. Furthermore, the group also creates the opportunity to meet Nordic colleagues and share culture, experiences, and ways of living.



Group photo taken at the reference group meeting in the Faroe Islands, March 2024, in front of the Nordic House





Trollstigen, Norway 2016



Photo: Coco Krusbæk, Opera Park, Copenhagen 2024



Photo: Nordic Sustainable Construction, Malmö 2024

Afterword: Is Future-Proof Construction Possible?

By **Helle Redder Momsen**, Head of Secretariat of the Nordic Sustainable Construction Programme

As we conclude these three years of the Nordic Sustainable Construction Programme, we reflect on its remarkable journey and achievements. This programme has been a testament to the power of collaboration, innovation, and dedication across the Nordic region.

Working with the programme, I have experienced great benefits from gathering and discussing across the Nordic countries. We are different in many ways: our weather and climate create different challenges for the built environment and new construction projects, our culture creates different needs in what the buildings should be able to perform, and our political priorities and regulations vary. However, we also have a lot in common in the way we build and the challenges, we need to overcome. The Nordic Vision 2030 underlines this, working as the central, unifying factor in our efforts.

The achievements of this programme demonstrate that we are on the right path. However, the journey is far from over. I hope this book will inspire to continue finding common solutions in the Nordics and beyond, and to harmonise practices where it is feasible. I also hope that the concrete recommendations and tools that we have mapped and developed will be shared and used as a knowledge foundation for the coming decisions and changes that needs to be made.

Continuous effort, adaptation, and collaboration will be essential as we face new challenges and opportunities. To foresee in detail what challenges, trends and solutions the coming years will bring, is impossible. While nothing is ever entirely future-proof, we can, however choose to build in a way that is more future-oriented.

This toolbox is thus not just a culmination of our work but a foundation for future endeavours. It equips stakeholders with the knowledge, tools, and inspiration needed to build a greener future. As we move forward with some of the knowledge, let us remain steadfast in our mission to create a built environment that is not only resilient and efficient but also harmonious with our planet.



Sørvangen, Norway 2016



About this publication

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Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

Nordic co-operation has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

Nordic co-operation promotes regional interests and values in a global world. The values shared by the Nordic countries help make the region one of the most innovative and competitive in the world.

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